amended claim 37 would not adequately describe the structural differences outlined in Applicant's arguments of the last amendment. Applicant believes that by amending the claim to more closely comply with the language of the specification, the terms in the claim should be defined according to the specification and therefore adequately distinguish the present invention from the prior art.

Applicant also contends that while the prior art passively mentions the combination of a fuel cell with an integrated circuit, which is one of the principal features of the pending claims, the prior art does not provide an enabling disclosure as to how these two structures may be combined on a single substrate.

6. Applicant believes that the Examiner's Summary and item 5 above identify the general thrust of the principal arguments presented to the Examiner.

7. The Examiner suggested that in any subsequent Office Action, Applicant should adequately distinguish the present invention from the prior art. The Examiner also pointed out that if new matter were added, a second search would be required. Applicant then reiterated that he believed the prior art did not disclose a combination of a fuel cell and an integrated circuit, but only passively mentioned the possibility of such. The only disclosed circuitry in the prior art Applicant is able to identify is a passive resistor in the Jankowski et al. patent comprised solely of a conductive layer.

REMARKS

This Amendment is in response to the Office Action dated March 2, 2004 and the telephone conference with the Examiner on April 8, 2004. In the Office Action, the Examiner made final the

rejection of all pending claims 37-54 as being indefinite and as being obvious in light of U.S. Patent Application 32003/0138685 to Jankowski et al and U.S. Patent No. 6,541,149 to Maynard et al. In the telephone conference, Applicant suggested replacing some of the indefinite verbiage with the term "transistor" based on the common meaning of the term "integrated circuit" as including at least one transistor. The Examiner suggested that in order for this to be acceptable, Applicant would have to show that at least one transistor is part of the common meaning for the term "integrated circuit" and that the cited prior art did not teach how to combine a fuel cell with a transistor. Applicant also indicated that he felt that the present invention is further distinguished by the structural distinctions of the anode conductor, specifically its porosity, and the porous and conductive nature of the substrate. The Examiner indicated that these changes may require an additional search. However, Applicant respectfully believes that the Amendment, replacing the term "polygonal array" with the term "patterned array" adds no new matter to the invention. The patterned array is explained and defined in paragraph 36 of the specification and the Amendment merely replaces language in the claim with the language of the specification. In this Amendment, Applicant has also provided three sources of the common definition of the term "integrated circuit", all of which include at least one transistor. Applicant has also provided arguments as to why the prior art does not disclose the present invention and has amended independent claim 37 such that it more clearly defines the distinctions between the invention from the prior art.

In paragraph 4 of the Office Action the Examiner rejected the claims as being indefinite because the language of claim 37 included the terms "active circuit" and "passive circuit" that were not used in the specification. Applicant has amended claim 37 by removing those terms and replacing them with "transistor". As discussed in the telephone conference on April 8, 2004,

Applicant believes that although the specific term "transistor" was not used in the specification, it is nonetheless disclosed by use of the term "integrated circuit" and item 60 in Figures 3A-3F. Attached are the definitions of "integrated circuit" from three different sources. Each definition states that an integrated circuit is comprised of at least transistors. Applicant believes that those skilled in the art interpret the term "integrated circuit" as having the same meaning defined in these sources. Applicant believes that this is especially so when this term is combined with Figures 3A - 3F. Those skilled in the art will recognize that the shape of element 60 is that of a typical transistor. Therefore, Applicant believes that use of the term "transistor" in Claim 37 does not add new matter.

The Jankowski et al. patent application in the Abstract and paragraph 2 states that fully-integrated control circuitry may be used in conjunction with the described invention. However, no where in the disclosure or the drawings is it explained how an integrated circuit or control circuit may be incorporated into the invention. Incorporating an integrated circuit with the substrate of the Jankowski et al. application would be understood by those skilled the art as not being a trivial matter. Applicant's disclosure, on the other hand, illustrates in Figures 3A-3F and the associated text how a transistor or other integrated circuit may be included on the substrate of the fuel cell. The Jankowski et al. application may be compared to the classic example of "warp drive". Merely including the term "warp drive" in a disclosure would not allow an Applicant to obtain a patent in the absence of an adequate description of how a warp drive may be achieved. In the Jankowski et al application, the disclosure merely contemplates circuitry being added to the invention without explaining how that may be achieved. Applicant believes that the present invention is no more disclosed by the Jankowski et al. application than warp drive is disclosed by a StarTrek episode.

Jankowski et al. does disclose a method of incorporating a resistor into the fuel cell structure. However, those skilled in the art will appreciate that the method of adding a resistor disclosed in the Jankowski et al application comprises merely adding a patterned conductive layer during the etching process. This is a relatively simple step in the fabrication process and is substantially different than the present invention's concept of adding a separately manufactured integrated circuit to the substrate of a fuel cell.

The Maynard et al. patent in the Abstract and Summary of the Invention, lines 33-38 also states that it becomes possible to integrate the fuel cell with silicon-based circuitry but fails to disclose any method of incorporating an integrated circuit with a fuel cell. Applicant believes the Maynard et al patent actually teaches away from the present invention because it describes an etching technique that would damage or destroy an integrated circuit attached to its substrate. Applicant's disclosure paragraph 42 teaches that care must be taken to protect the integrated circuit from damage during assembly of the membrane electrode assembly.

Another distinction more clearly explained in the amended claims is that the substrate is conductive and utilized to carry current from the cathode. In the Jankowski et al. patent application the substrate material is non-conductive (i.e. nitride, alumina, glass, ceramic, plastic) and the anode and cathode are deposited onto it.

Another distinction more clearly described in amended claim 37 is that both the cathode and the anode conductor are porous. The anode conductor is explained in paragraph 36 as being formed from a highly conductive metal in a patterned array that is porous. As can be seen in Figure 2M and 2O, the anode conductor comprises relatively thin wires in a hexagonal pattern. As stated in paragraph 36, such a patterned array is preferred because it proffers little resistance to gas flow. This

increases the fuel cell's efficiency. Those skilled in the art will appreciate that the shape of the pattern is not important as long as the conductor does not have resistance to gas flow. The array may be hexagonal, rectangular, triangular or any of various other patterns. Applicant believes by describing it as patterned rather than a polygonal array, it is more clearly distinguished from prior art anode conductors.

In the March 2, 2004 Office Action, the Examiner rejected Applicant's arguments because the claim language does not adequately describe structural features that Applicant's arguments relied upon. The amendments to Claim 37 attempts to correct this so that the features described in the above two paragraphs are properly incorporated into Claim 37.

For all the above reasons, Applicant now believes that the application should be in condition for allowance and such action is earnestly solicited. If, for some reason, any other issues remain, a telephone conference with the Examiner is respectfully requested.

Respectfully submitted,

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Integrated circuit

from Websters New Universal Unabridged Dictionary, based on the second edition of The Randon House Dictionary of the English Language, the Unabridged edition, copyright 1993, 1987, 1996, Barnes and Nobles Books:

"A circuit of transistors, resistors and capacitors constructed on a single semiconductor wafer or chip, in which the components are interconnected to perform a given function."

The Columbia Encyclopedia, Sixth Edition. 2001.

integrated circuit

(IC), electronic circuit built on a semiconductor substrate, usually one of single-crystal silicon. The circuit, often called a chip, is packaged in a hermetically sealed case or a nonhermetic plastic capsule, with leads extending from it for input, output, and power-supply connections, and for other connections that may be necessary when the device is put to use. Integrated circuits can be classified into two groups based on the type of transistors they contain. Bipolar integrated circuits contain bipolar junction transistors as their principle elements. Metal-oxide-semiconductor (MOS) integrated contain MOS transistors as their principle elements. Some integrated circuits contain both types of transistors. Integrated circuits are also categorized according to the number of transistors or other active circuit devices they contain. An IC is said to use small-scale integration (SSI) if it contains fewer than 10 transistors. An IC that contains from 10 to 100 transistors is said to use medium-scale integration. A large-scale integration (LSI) IC contains from 100 to 1,000 transistors, and one that uses very-large-scale integration (VLSI) contains more than 1,000 transistors. Some integrated circuits are analog devices; an operational amplifier is an example. Other ICs, such as the microprocessors used in computers, are digital devices. Some hybrid integrated circuits contain both analog and digital circuitry; a bilateral switch, which switches analog signals by means of a digital control signal is an example of a hybrid IC. Integrated circuit functions are virtually limitless. Improvements in IC manufacturing have led to increasingly dense and capable integrated circuits. Some microprocessors, for example, contain more than one million transistors on their chips. The smaller, denser chips can also provide speed benefits, because in high-speed devices, the length of time it takes a signal to travel a given distance can become a factor. The major fabricating steps for integrated circuits include film formation, impurity doping, photolithography, etching, and packaging. See microelectronics. *1*

See M. S. Malone, *The Microprocessor: A Biography* (1995). *2*

Integrated circuit

From Wikipedia, the free encyclopedia.

An **integrated circuit (IC)** is a microelectronic semiconductor device consisting of many interconnected transistors and other components.